

Patent Claims

1. Door space monitoring device for monitoring a door swing area of a vehicle door, with sensor means sensing in the door swing area, with a sensor-data evaluating evaluation unit and with a control unit for controlling the sensor means or evaluation unit, thereby characterized, that the monitoring area sensed by the sensor means is substantially two-dimensional, that the sensor means includes at least one light source for emission of a pivotable light beam, at least one micro-mirror-unit and at least one photo-detector for monitoring the two-dimensional monitoring area.
2. Door space monitoring device according to Claim 1, thereby characterized, that the micro-mirror-unit with it's at least one micro-mechanical pivotable planar mirror is associated with an additional non-planar mirror.
3. Door space monitoring device according to Claim 1 or 2, thereby characterized, that the additional non-planar mirror is shaped such that its contour corresponds to the contour of the vehicle door.
4. Door space monitoring device according to Claim 2 or 3, thereby characterized, that the additional non-planar mirror is mounted to be pivotable and is preferably micro-mechanically driven.

5. Door space monitoring device according to one of the preceding claims, thereby characterized, that the light source for emission of a pivotable light beam, the micro-mirror-unit and the photo-detector for detecting the two-dimensional monitoring area are provided on or in an external mirror which is attached to the vehicle door, or provided on or in a vehicle door handle.
6. Door space monitoring device according to one of the preceding Claims 1 through 4, thereby characterized, that the light source for emission of a pivotable light beam, the micro-mirror-unit and the photo-detector for detecting the two-dimensional monitoring area are provided in the area of the pivot axis of the vehicle door.
7. Door space monitoring device according to one of the preceding claims, thereby characterized, that the light source for emission of a pivotable light beam, the micro-mirror-unit and the photo-detector for detecting the two-dimensional monitoring area are provided in a common housing.
8. Door space monitoring device according to Claim 7, thereby characterized, that within the housing the micro-mirror-unit is provided between the light source for emitting a pivotable light beam and the photo-detector, and that offset to the side thereto, the control unit and/or the

evaluation unit are provided preferably upon a common circuit board.

9. Door space monitoring device according to one of the preceding claims, thereby characterized, that the at least one photo-detector is a PIN-diode.
10. Door space monitoring device according to one of the preceding claims, thereby characterized, that the control unit is so designed, that the light output of the light source controlled by the control unit is adjusted according to the degree of pivoting of the at least one micro-mechanical mirror of the micro-mirror-unit.
11. Door space monitoring device according to one of the preceding claims, thereby characterized, that the control unit is so designed, that the pivoting of the at least one micro-mechanical mirror of the micro-mirror-unit is controlled by the control unit to pivot at regular intervals over a predetermined pivot range to produce a light beam passing through the two-dimensional monitoring area.
12. Door space monitoring device according to Claim 11, thereby characterized, that the control unit is so designed, that a pivoting over a predetermined pivot range occurs within a time span TS of less than 5 ms.

13. Door space monitoring device according to Claim 12, thereby characterized, that the control unit is so designed, that between two pivot processes a time span TP of greater than 25 ms and preferably less than 50 ms occurs.
14. Door space monitoring device according to Claim 12 or 13, thereby characterized, that the control unit is so designed, that the light source and preferably also the photo-detector are activated essentially only during the pivot process, preferably only during each n-ten pivot process with n being less than 10.
15. Door space monitoring device according to one of the preceding claims, thereby characterized, that the light source for emitting a pivotable light beam, the micro-mirror-unit and the photo-detector for detecting the two dimensional monitoring area are so arranged, that the distance of the two dimensional monitoring area from the vehicle door essentially also increases with increasing distance of the two dimensional monitoring area from the pivot axis of the vehicle door.
16. Door space monitoring device according to one of the preceding claims, thereby characterized, that the light source for emitting a pivotable light beam, the micro-mirror-unit and the photo-detector for detecting the two dimensional monitoring area are provided in a common

housing together with the evaluation unit for distance measurement by means of a phase delay process.

17. Door space monitoring device according to Claim 16, thereby characterized, that the evaluation unit is adapted to carry out on the basis of reference values, preferably a lookup table stored in memory, corresponding to the shape or design of the vehicle door, an evaluation of relevance for potential detected obstacles.
18. Door space monitoring device according to one of the preceding claims, thereby characterized, that dependent upon the detection of an obstacle in the door swing area a warning signal is emitted, a further automatic opening of the vehicle door is interrupted, or a further opening of the vehicle door is actively prevented.